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# Applying GIS in practitioner settings

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## **Abstract**

This paper focuses on the involvement of CURS in a project aimed at developing an integrated GIS to facilitate inter-agency data sharing and analysis so as to enhance the planning and provision of family services in the Hunter. The paper focuses on the process of developing the 'soft technologies of engagement' necessary to facilitate the co-operative data-sharing between key government human services agencies that must underpin an integrated GIS. These soft technologies are required to address the ethical, procedural and technical challenges of data sharing and, more intangibly, to manage the organisation and institutional barriers to inter-agency data sharing. The paper outlines a template of ethical protocols and procedures for data-sharing as a first step in developing longer term inter-agency engagements. Crucially though, the paper argues that the process of engagement is central to the development of an informed and critical community of practitioners within government agencies. We see this longer term engagement as having the potential to address some of the broader epistemological and ontological critiques of GIS and spatial indicators.

## **Keywords**

settings, practitioner, applying, gis

## **Disciplines**

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## Applying GIS in practitioner settings

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**Abstract:** This paper focuses on the involvement of CURS in a project aimed at developing an integrated GIS to facilitate inter-agency data sharing and analysis so as to enhance the planning and provision of family services in the Hunter. The paper focuses on the process of developing the 'soft technologies of engagement' necessary to facilitate the co-operative data-sharing between key government human services agencies that must underpin an integrated GIS. These soft technologies are required to address the ethical, procedural and technical challenges of data sharing and, more intangibly, to manage the organisation and institutional barriers to inter-agency data sharing. The paper outlines a template of ethical protocols and procedures for data-sharing as a first step in developing longer term inter-agency engagements. Crucially though, the paper argues that the process of engagement is central to the development of an informed and critical community of practitioners within government agencies. We see this longer term engagement as having the potential to address some of the broader epistemological and ontological critiques of GIS and spatial indicators

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### Introduction

This paper focuses on the involvement of the Centre for Urban and Regional Studies with a group of NSW government agencies charged with the provision of family services in the Hunter. This is part of an ARC Linkage project with NSW Premiers' Department. We are working with them using GIS to integrate some of their key data sets so as to produce informative spatial indicators and to establish an integrated GIS for use in their ongoing policy development and planning activities. In this paper, we examine the challenges of inter-agency data sharing that have to be negotiated before any such integrated GIS is possible. In the paper, we outline our development of a set of Protocols and Procedures for Data Sharing (PPDS) designed to manage these challenges. In addition, we develop an argument that the PPDS, along with a series of training workshops for the ultimate users of the integrated GIS, have the potential to address some of the broader critiques that social theorists have long targeted at GIS: namely epistemological, ontological and ethical critiques.

The Centre for Urban and Regional Studies (CURS) is involved with a multi-agency initiative called *Families First*—a whole-of-government initiative which is enacting integrated early intervention support services to enhance the well-being of families with children (aged 0-8yrs). The purpose of *Families First* is to develop integrated service delivery by five government agencies—Area Health Services (HAHS), Community Services (DOCS), Education and Training (DET), Housing (DoH) and Disability, Ageing and Home Care (DADHC). The initiative's whole-of-government context demands integration and this requires new ways of using information and data within and between agencies. The potential for an integrated GIS to offer key support to the functioning of the *Families First* initiative by enhancing data management and

enriching agencies' capabilities is clear (see e.g. Dawes 1996, Brown and Brudney 1998, Ventura 1995).

Our ultimate concern is to develop this integrated GIS, which represents the hard technology of the project, but our initial concern has been to develop 'soft' technologies of engagement between the agencies to enable the data sharing on which the rest of our work is dependent. There is a sizeable literature, however, that attests to the difficulty of enacting successful collective action among government agencies. Achieving data sharing requires a host of technical, institutional and ethical barriers to be negotiated. It follows that CURS' involvement must begin by generating and enacting procedures and protocols to enable data sharing.

### **Barriers to inter-agency data-sharing**

Before examining the Protocols and Procedures for Data Sharing (PPDS) we have developed, we set out here what are the barriers they are designed to address. Their basic purpose is to enable the advantages of data sharing to be better realised. Coppock's argument that *"there is surely a case for a more collaborative attitude towards data on the part of those who collect them, and a recognition that it is in the public interest that such data, largely collected with public funds, should be widely used"*, is a common one (1988:20 cited in Higgs 1999). But the optimistic tone belies the realities of inter-agency data sharing that immediately confront anyone charged with operationalising it. There are the technical and organisational barriers to 'interoperability' e.g. mismatched data structures, systems incompatibilities, agency cost structures, and data release restrictions. Perhaps more intractable though are the institutional constraints arising from state agencies' practices, habits and norms. These are 'constructed and maintained by particular forms of knowledge and expertise, well-defined policy territories and patterns of resource allocations' (Cowell and Martin 2003: 163). Their existence means that enacting data sharing is much more than a straight-forward matter of ensuring that the 'technical plumbing' works (Landsbergen and Wolken 2001). A vast and multidisciplinary literature characterises the internal (technical and organisational) and external (institutional and political) obstacles that litter its pathway (e.g. Ventura 1995, Dawes 1996, Landsbergen and Wolken 2001, Schein 1996, Nedovic-Budic and Godschalk 1996, Salmela and Turunen 2003, De Long and Fahey 2000, Drake *et al.* 2004, Higgs 1999, Theseira 2002).

The complexity of data sharing emerges primarily from the critical role played by information in public sector practice. State agencies are marked by 'information territorialism' (Slayton 2000: 12). The ownership of information and control over its access and use are key components of the boundary practices that are inherent in constructing agency identity, measuring agency performance, securing agency resources and justifying agency existence. These are all high-stakes processes, intensified by the audit explosion that has accompanied neo-liberalised public sector management and the marketisation of public service delivery. Agencies are monitored, measured and judged by evaluative frameworks and standards built around a hierarchy of key programme objectives, outcomes and, notably, performance indicators (Osborne and Gaebler 1992, Laffin and Martin 1995, see Premiers' Department 2004). Accountability to a host of performance indicators is explicitly connected to budgetary allocations (see Mee and Moore 2004) so there is intense political pressure to discipline performance around achieving pre-determined metrics and this has driven transformations in work practices and in the ethos of service delivery (Salmela and Turunen 2003). In this climate, an agency's information is no

innocent entity: it is commodity and currency, weaponry and armour. Data sharing, then, constitutes multi-faceted risk. Four points can be made about the nature of that risk.

*First*, there are risks involved in releasing data produced within one agency's organisational culture, and conforming to that agency's data standards, for uncontrolled use by another. At a technical level, there is a lack of standardisation across agencies re data collection objectives, levels of precision, methods of description, encoding or labelling (Higgs 1999). These technical variations can produce a lack of trust across agencies with differing functional specialisations regarding common understanding of data reliability, categories and meanings and these create a reticence around data-exchange and doubts about the legitimacy of data exchanged (Ventura 1995). But difficulties arising from different data collection traditions are intensified by the varied orientations to data that arise from the multiple organisational cultures and sub-cultures that exist across agencies. These cultures are embedded in different discourses, language and value systems and different modes of knowing/knowledge systems (Schein 1994, Drake *et al.* 2004). The multiple professional frameworks across these cultures induce varying data needs suited to agencies' primary constituencies. DeLong and Fahey (2000) demonstrate how different organisational cultures gather data through different categories, query it through different metrics whose meanings do not always translate self-evidently, and process and use data outputs differently. They argue convincingly that culture shapes understanding of what knowledge is worth managing, who must share it and who can hoard it, how knowledge will be used. Critically for us, they also argue that culture shapes understanding of the processes whereby new knowledge can be created. Consequently, cultural 'mismatches' between agencies (e.g. between market-oriented vs procedure-oriented cultures) can result in dysfunctional interactions between them (Schein 1996) as 'each (culture) looks for different data, with different sense- and meaning-making lenses, and with different intentions and purposes for its use' (Drake *et al.* 1996:75). They may be suspicious of other agencies due to unclear understanding of their policies and duties and wary that they do not necessarily share understandings of knowing what to look at, what it means and how to use it (Williams 1996). In a multi-agency data environment, then, the existence of varied data cultures inhibits any straight-forward notion of data sharing.

*Second* is the risk of unintended use. Agencies regard their data as complex and context-sensitive. They are frequently fearful that broader access to undigested, decontextualised information will result in its misinterpretation, distortion or unintended use (Landsbergen and Wolken 2001; Drake *et al.* 2004). The need to control and marshal data effectively is intense, with the new public management paradigm fashioning agencies as competitive units that are 'hyper-accountable' to auditing regimes (Landsbergen and Wolken 2001:214). Neo-liberalised public sector budget practices and a climate of resource constraint also pitch agencies into relentless competition for budget-share. Data released by government agencies to their competing agencies can be used to re-balance agency budget claims. It can be re-analysed to produce conclusions different to the 'official' departmental interpretation, used to support different conclusions on agency performance, to validate or refute prior policy decisions and to re-prioritise service provision. Likewise it could be released in a media arena resulting in raised public visibility, or released in a political arena exposing agencies to heightened scrutiny and political attention and micro-management (Landsbergen and Wolken 2001, Ventura 1995, Dawes 1996). As a consequence, agencies often favour maintaining agency discretion and are slow to release data into a forum where its application cannot be controlled. In short, turf protection means that agencies control and marshal data release intensively (Stamoulis *et al.* 2001).

*Third*, data sharing is a resource risk. Public sector budgetary-regimes produce an intense sensitivity to the distribution of resource costs and benefits so that anything that generates costs or appears as a resource-drain is viewed with suspicion (Dawes 1996). As a result agencies are 'risk averse' to initiatives, such as data sharing, that have unproven, uncertain or imperceptible agency-specific benefits (Campbell 1995, Nedovic-Buvic and Godschalk 1996, Dawes 1996, Higgs 1999, Landsbergen and Wolken 2001). They may reject expending their resources to meet the responsibilities or administrative costs of meeting data requests from other agencies. If potential cost-savings of data sharing cannot be identified and claimed for a given agency or if improved performance cannot be captured through metrics that demonstrably assist agencies meet their specific KPIs, again, agencies may balk at involvement (Higgs 1999, Ventura 1995). The unambiguous and calculable benefits that agencies require to justify expending resources is not always immediately clear when it comes to data sharing.

*Fourth*, data sharing can modify access to informational resources and patterns of knowledge distribution across an organisation and, as such, suggests risk in the form of disruption to agency status hierarchies, identity, responsibility and authority claims (Bellamy and Taylor 1996, Menzel 1998). Broader institutional access to data may result in discounting agency expertise, undercutting agency discretion in policy and program decision-making (Dawes 1996: 391). Such risk is not often welcomed. Agencies' data is the embodiment of their expertise. In the context of increased privatisation of government roles and service provision, agencies are directly threatened by the prospect of data collection, storage, analysis and reporting being outsourced to an external agency (Salmela and Turunen 2000). The continual spectre of government review and institutional rationalisation creates an ethos of self-preservation (Higgs 1999) in which public agencies preserve their value by limiting access to 'their' informational resources (Brown and Brudney 1998, Salmela and Turunen 2000). Agencies 'own' their data and are proprietorial of the knowledge embodied in its analysis.

Clearly then, multi-agency data sharing presents multiple risks to government managers, who frequently respond with caution and 'informational rectitude' (Bellamy and Taylor 1996). In short, inter-agency data sharing is a complex, messy and non-linear process. It is, potentially, a 'jigsaw of conflict and cooperation' (Campbell 1995: 627). Understanding this is what prompted CURS' development of Protocols and Procedures for Data Sharing (PPDS) so as to develop reproducible techniques to overcome the technical, organisational and ethical issues of data sharing so that we can proceed in our collaboration with *Families First*. Fundamentally too, however, we see this process of enacting the PPDS as central to developing agencies' orientation towards ethical and critical GIS practice.

### **Over coming the barriers?**

A draft template is being currently being developed for use on a trial project—a specific focus of inquiry around which available data sources (including both agency and non-agency) will be assembled, mainly for integration into a GIS. We envisage that using the PPDS would ultimately become common practice so new instances of data sharing do not need to be renegotiated anew each time and needless repetition might be avoided (see Table 1).

**Table 1** Protocols and procedures for data sharing (PPDS)

<b>Design the project question</b>	-	Establish common project objectives
	-	Establish explicit uses and users
	-	Ensure understanding of strategic information needs of participants
	-	Establish supervision and reporting group
	-	Clarify policy and funding context
	-	Designate information contact person
	-	Identify staff training opportunities
<b>What type of data is available, where is it located and what sort of format is it in?</b>	-	Develop data inventory
	-	Identify criteria for selection of data
	-	Clarify data definitions and meta data
	-	Identify steps necessary to produce data in usable format
<b>Gain permission to acquire and process data</b>	-	Agencies to identify capacity to share information
	-	Authorisation to share
	-	Legal constraints
	-	Ethical protocols with which required to comply
	-	Known policy constraints
	-	Other data collection constraints
	-	Data ownership including copyright/property rights
	-	Assess need to amalgamate data to appropriate scale
	-	Identify sharing agreements including informal agreements
<b>Negotiate issues related to ownership and publication</b>	-	Confidentiality
	-	Clarification of costs and their apportionment
	-	Identification of nature and location of outputs
	-	Access criteria
	o	Identify who needs access
	o	How access it to be limited
	o	How authorised users will acquire authorisation
<b>Ethics procedures, evaluation and other outcomes</b>	-	Develop evaluation procedures
	-	Establish project milestones, timetable and participant responsibilities
	-	Confirm and submit ethics applications
	-	Commence data collection

The *first* stage in the process is to clarify the purpose of the specific project question and the expected outcomes to be yielded by data integration. This stage seeks to establish common goals across the agencies and builds our critical understanding of the policy issues. It identifies key 'champions' of the process within each agency. Significantly, it is also the first stage where we start to identify appropriate training opportunities for practitioners. The *second* stage involves producing an inventory of the full range of available data and, through a process of deliberation, establishing the criteria for choice re what data sets will be included. This stage also clarifies the nature and quality of each data set. While this benchmarks data quality standards, it simultaneously develops our and the agencies' critical understanding of the data, and it builds agencies' trust in each-others' data. This stage is also critical to identifying the steps needed to address data compatibility and the steps necessary to spatially reference the data. And staff training possibilities also emerge from this stage.

The *third* stage is a complex one. It involves negotiation of ethical clearances and a suite of other authorisations required to release the data. Agencies' capacity to release data for use in contexts other than which they were collected is generally subject to rigorous regulation. First, there is legislative constraint. The list of pertinent legislation is long (see Case Co-ordination and Information Exchange Template, DAIS 2003) and will apply in different combinations to different agencies and proposed usages. Second, there is policy constraint (e.g. dissemination policy) likely to exist in varying forms across agencies depending on their mandates. Third, they may be data-specific copyright constraints. So this stage involves lots of clarification, recognition of the sensitivity of certain data, and active inter-agency negotiation on the release of data. This stage also brings to the surface each agency's institutional ethics clearance procedures and those to which we are subject through the University's system. These are all subject to particular interpretive practices, and to the culture and experience of the individual ethics committees. Working through the ethics approval process (and the steps leading to it) requires ongoing inter-agency discussion and collaboration around notions of ethical data sharing practice and negotiation around how these will be managed. Managing this interaction is a complex task. This dialogue involved will reverberate too through the training workshops to follow. The *fourth* stage develops the guidelines that will determine how data costs will be managed and how outputs of data analysis will be located and accessed. Clearly, this will be a negotiated process (again) in which the sensitivities and solutions are highly contingent on project questions and outcomes of previous. The *fifth* and final stage involves important project management tasks to ensure that the actions identified in the previous stages are enacted and responsibilities allocated. Once the PPDS has been enacted, we can proceed with the construction of an integrated GIS and can begin a process of training workshops to engage practitioners in its critical use.

However, the power of this template is realisable only through its practice. It represents a process, not a blueprint for action. Landsbergen and Wolken (2001:215) echoes this when they argue that, for data sharing, 'no centralised rules can possibly be flexible enough to anticipate and support the information needs of the many diverse policy networks—they must be self-generated'. Any template that addresses the technical and ethical implications of data sharing needs to be, in Esnard's (1998) words, 'portable and provisional': *portable* from project to project, software to software, academy to practice and *provisional* in that the ethical standards applied to the template operates at the level of principles, the enactment of which must be determined in context. The technical, organisational and ethical questions raised in any specific instance of data sharing are highly contingent, being dependent upon variable social contexts. We argue that the practice of the PPDS provides a useful framework for working systematically through this context and, in a bolder argument, is capable of addressing fundamental critiques of the ethics and epistemology of GIS levelled by social theorists.

### **Enhancing critical GIS practice**

The social theoretic critique of GIS is now well established. These critiques have targeted practitioners' under-developed critical thinking regarding, as Pickles famously put it, 'the epistemology of their subject, the ontology of their objects and the political commitments embedded in their practices' (1997: 364). Kwan sketched the architecture of the critique concisely in noting that that GIS is targeted for 'its inadequate representation of space and subjectivity, its positivist epistemology, its instrumental rationality, its technique-driven and data-led methods and its role as a surveillance technology deployed by the state' (2002c: 645). Table 2, developed from Harris and Weiner's work for the National Centre for Geographical



Information Analysis, fleshes out this architecture more thoroughly (<http://www.ncgia.ucsb.edu/varenius/ppgis/paper/harris.html>).

**Table 2** Social theoretic critiques of GIS

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**EPISTEMOLOGY / ONTOLOGY**

- a. perceived embeddedness in GIS of positivist epistemology assuming a straight-forwardly observable, knowable and representable universe—the intellectual heir of the quantitative revolution (Sui 1994) (e.g. Aitken and Michel 1995, Lake 1993, Pickles 1995, Taylor 1991, Taylor and Johnston 1995);
- b. perceived embeddedness of GIS in an ontology committed to a single, objectifiable reality with an existence independent of the observer (Aitken and Michel 1995, Sheppard 1995);
- c. the claimed value-neutral, benign and objective nature of GIS (Openshaw 1992; Lake 1993);
- d. the apparent pre-eminence given to *data and facts* and the retreat from *knowledge* (Goodchild 1991, Taylor 1990, Pickles 1995); and
- e. that an enterprise GIS methodology and knowledge creation are data-driven and/or technologically driven (Esnard 1998, Kwan 2002c).

**REPRESENTATION and ETHICS**

- f. failure to critique the implications of digital representation and the map as metaphor (Mark 1993, Harley 1990, 1991);
- g. poorly developed conceptualisation of ethical and responsible use related to issues of epistemology, ontology and representation (Crampton 1995, Curry 1995);
- h. the surveillant capabilities and trends toward controlling populations and engineering knowledge (Pickles 1995, Goss 1995); and
- i. the threats to privacy and confidentiality engendered by its data profiling and data-matching capabilities and geodemographics (Curry 1995, Goss 1995).

**POLITICAL ECONOMY**

- j. the hegemonic power relations served by the technology and the knowledge it predominantly produces (e.g. cultural bias) (Mark 1993, Rundstrum 1995, Goss 1995, Roberts and Schein 1995);
- k. the commodification of data and the development of a technocratic, bureaucratic-informational complex (Onsrud and Rushton 1995, Haque 2003, 39, Curry 1997a and 1997b); and
- l. the anti-democratic nature of GIS embodied in differential access to data and technology (McHaffie 1995, Edney 1991, Pickles 1995).

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Source: Developed from Harris and Weiner (<http://www.ncgia.ucsb.edu/varenius/ppgis/paper/harris.html>).

The 1990s debates round these critiques became mired in such hostility that GIS practitioners and their social theorist critics tended to talk past each other. GIS practitioners tended to dismiss critiques as impenetrable, abstract, or pointless (Miller 1995) while, in their turn, social theorists developed an essentialist critique of GIS as inescapably positivist and incapable of acknowledging the social production of knowledge (see Schuurman 2002 and Taylor 1990, Pickles 1995, Kwan 2002a). An oppositional discourse still remains that engages in unproductive binaries that cast positivist/quantitative against critical/qualitative approaches and pits GIS/spatial analysis against social/critical theory (Kwan 2002b).

Here we address some of these critiques with reference to the PPDS template and the related training opportunities we envisage. By engaging these ‘soft technologies’ to manage engagement with and across GIS-user agencies we hope to address some of these critiques by: (i) engaging with them reflexively from within rather than outside the practice of GIS (see Schuurman 2002, Schuurman and Pratt 2002); (ii) developing the critical agency of GIS users to disrupt problematic tendencies in the deployment of GIS that, while common, are not *essential* to its practice (Aitken and Michel 1995, Kwan 2002c, Sheppard 2001); (iii) consciously developing

amongst GIS users and ourselves, an ethical discourse that is sensitive to the critical recognition of the implications of epistemological and ontological assumptions and representational strategies employed in GIS practice. The aim here is to create reflexive GIS users in the government agencies with whom we are working. We deal with each of these in turn through three conscious and practical strategies.

### *1. Contextualised project-focussed application by locally knowledgeable agencies*

*First*, we focus the template and workshops around a specific project focus and this is critical for three reasons. It engages researchers and the final users of the GIS in a very specific institutional, informational and socio-economic context. So our work is driven by a contingent policy need rather than by data-availability or technological capacity (Esnard 1998). Agencies have in-depth, localised knowledge and experience of their local context and this can expose the epistemological and ontological frailties of GIS. It challenges the ontological assumption that that GIS necessarily operates from an external vantage point, capable of the 'god-trick of seeing everything from nowhere', in Haraway's (1991, 189) famous phrase.

*Second*, agencies' in-depth knowledge of their localities and the complex cultures of their communities are likely to produce critical readings of GIS outputs based only on digitally capturable, quantifiable data about the characteristics of individuals and places. Local practitioners' experience produces an understanding of place and community different to a conventional GIS optic of the world as constituted by geometric, gridable, 'absolute' space and peopled by statistical aggregates of individuals (Curry 1997b). Practitioners are likely to assess these outputs as deeply informative yet *partial* encapsulations of local social reality (see Sheppard 2001). So, the contextual and critical deployment of GIS by locally knowledgeable practitioners nurtures a post-positivist understanding of knowledge as contextual.

*Third*, the project-focused, locally-engaged use of GIS undermines any technologically-determinist assumption that the quality of decision-making is automatically and progressively improved simply by virtue of its use. Local agencies are too fully, and sometimes painfully, aware of the multiple local contingencies and local organisational behaviours that are liable to obstruct this.

### *2. Critical contextual assessment of data*

The process we have outlined requires detailed agency engagement in the assessment and selection of data for incorporation into the GIS. This has several benefits. *First*, this is a communicative process in which agencies must engage in dialogue and deliberation about their own data sources, their limitations, strengths and cultural contexts. There is an important opportunity for dialogue here to reveal and examine how specific values, categorisations and interpretive frames are embedded in institutional data sets. Notably, it can make clear how GIS' 'spatial analytical schematic' (Lake 2003: 462) favours inquiry into realms where accurate, precise, quantitative, 'objective' and, usually secondary, data dominate (Sui 1994).

*Second*, in selecting and rejecting data sets for inclusion in the GIS, agencies are faced in a very real and immediate sense with the recognition that data choices are political choices: they are 'predicated on a political stance and create political consequences' (Drake *et al.* 2004:780). The dialogue can explicitly reveal the historical and geographically contingent social process and political choices that underpin the integration of data into a GIS. Moreover it exposes what Helen

Longino (2002) has termed the 'local epistemology'—locally situated set of understandings and substantive assumptions—that provide the sounding board against which data deliberations and interpretations will be tested, justified and accepted as reliable or rejected (Leitner and Sheppard 2003). Engaging in the PPDS makes evident that data selection and rejection is value-laden, norms-driven and institutionally-constrained. So the applied and critical assessment of data by the GIS' ultimate users highlights to them the socio-political and institutional context of knowledge production that is rarely evident in the 'finished product' of GIS output.

### *3. Development of ethical discourse and practice*

Lastly, then, we see scope in the approach we are suggesting to extend the conceptualisation of ethics that currently dominates the GIS use of public agency data. The realm of ethics in GIS has tended to be dominated by technical aspects: questions of data accuracy, competent practice and protection of privacy (Haque 2003). These have been driven by an 'ethic of accuracy' (Harley 1989) such that data exchange formats, geometric precision, product liability, consistency of terms and definitions (i.e. technical specifications) have been at the forefront of discussions (Esnard 1998). A principal assumption has been that accurate data-gathering and technically competent analysis produces ethical use of GIS. And despite some efforts to broaden discussion (Esnard 1998, URIS 2003), debate has tended to be framed in legalistic rather than moral or social discourses (Curry 1999).

Our task is to engage practitioners in a more extensive ethical discourse, worked through in applied, locally familiar contexts. We are convinced by Crampton's (1995) argument that rules-based ethical system are internally-oriented and, as such, they instill rule-according behaviour without necessarily engaging practitioners actively in the specific externally-oriented ethical context in which they are operating at any given time. So, we aim to focus continually on building ethical awareness, on ensuring that the process of engaging an integrated GIS is based around ethical principles, the meaning of which need to be worked through in the particular situated context of practice.

In particular, we aim to pay critical attention to the rhetorical power of representation, and the ways in which GIS' cartographical flexibility intensifies that power. We want to develop a critical approach amongst practitioners to the cartographies that they produce and deploy: a wariness of maps' abilities to generate unitary, homogenising images and understandings of places (Curry 1997a, 1997b); a sensitivity to how they operate as prisms for particular ways of knowing (Harley 1990); an alertness to map's 'power-enhancing capabilities' (Harley 1989); and a healthy scepticism towards representational realism—the faith that GIS *can* represent socially and culturally complex geographical realities.

There is, of course a well-established critical literature that critiques the cartographic outputs of GIS as rhetorical devices with powerful narrative qualities enhanced by their association with scientific rigour, logic and precision (Harley 1990, Haque 2003). This literature draws our attention particularly to the way GIS cartographic can obscure both data choices and the transformation of data by algorithmic thinking such that they are too easily read as value free and objective representation of social reality (Aitken and Michel 1995). We address this possibility using the PPDS to nurture applied discussions about representations as socially-constituted images and ordering devices and, hence, about representational decisions as ethically-laden choices (Harley 1990, 1991). By being explicit about representation as a *process*, we avoid their

being used to validate action without sufficient attention to the values inherent in them. We aim to develop explicit recognition that representational choices produce visions of localities that are constitutive of place identity; recognition that 'depiction is never just an illustration. It is ...(the) product of a process of work. And it is the site for the construction and depiction of social differences' (Fyfe and Law 1988: 1). Our broader purpose is to situate agencies' GIS practice in an ethical discourse that makes explicit that there is an onus on the user to understand the implications of the representations they produce.

Critically, engaging the PPDS frames the discussion of ethics not in an abstract theoretical domain—such debates have proved ineffective in previous rounds of GIS critiques—but in a 'real-world' social context linked directly to practice. This enables practitioners to witness and reflect critically on the relationship between their use of GIS analysis to produce policy-informing knowledge and to consider consciously the ethical implications of the outcomes. We aim to illustrate in a manner that speaks directly to practitioners' real world experience that GIS outputs are responded to by public managers and become institutionalised in the policy trajectories and regimes of management that are applied to and that shape the lived realities of localities and communities. By working through from data sharing to critical ethical GIS practice, we hope the PPDS can assist in meeting these aims.

## Conclusion

The PPDS outlined suggests a process of engagement. Its challenge lies in negotiating the political context in which it, by definition, must operate; the *Realpolitik* of the daily practice of agency operation and the ethical and representational politics of the practice of spatial analysis. We suggest however that working with the PPDS enables the combination of the situated knowledges of practitioners and the technical knowledges of GIS-supported analysis, in the development of ethical GIS-practice. Its deployment is challenging but, we argue, stands to benefit critically-aware spatial analysis and critically aware policy making and service provision.

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Indeed, our involvement with *Families First* arose from the agencies' acute awareness of their need for better access to quality data describing the socio-demographic conditions of families in their region.

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